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# BRANCHINECTA CORNIGERA, A NEW SPECIES OF ANOSTRACAN PHYLLOPOD FROM THE STATE OF WASHINGTON

By James E. Lynch[1]

The fairy shrimp described below has been repeatedly collected by the writer since 1935 from numerous ephemeral fresh-water ponds in eastern Washington. The data in the specific diagnosis are based on measurements of ten apparently full-grown individuals of each sex. The specific name, *cornigera*, refers to the dorsolateral protuberances on the head of the female, which remind one of incipient horns.

## Genus *Branchinecta* Verrill, 1869

### *Branchinecta cornigera*, new species

Specific diagnosis: *Male:* Total length, from front to end of shaft of cercopods, 29 (25–36.5) mm. Average ratio of length of head and thorax to genital segments, abdomen, and cercopods 1 :1.3. Nuchal organ transversely oblong with rounded corners on top of head. Compound eye in lateral view slightly flattened dorsoventrally, 0.9 (0.75–1.05) mm. by 1 (0.95–1.2) mm. Antennule 2.6 (2–3) mm. long, terminated by three setae and eight aesthetascs. Antenna biarticulate, 7 (6–8) mm. long, extending back to the level of the fifth or sixth thoracic segment if flexed posteriorly. Proximal article 4.5

[1] School of Fisheries, University of Washington, Seattle, Wash.



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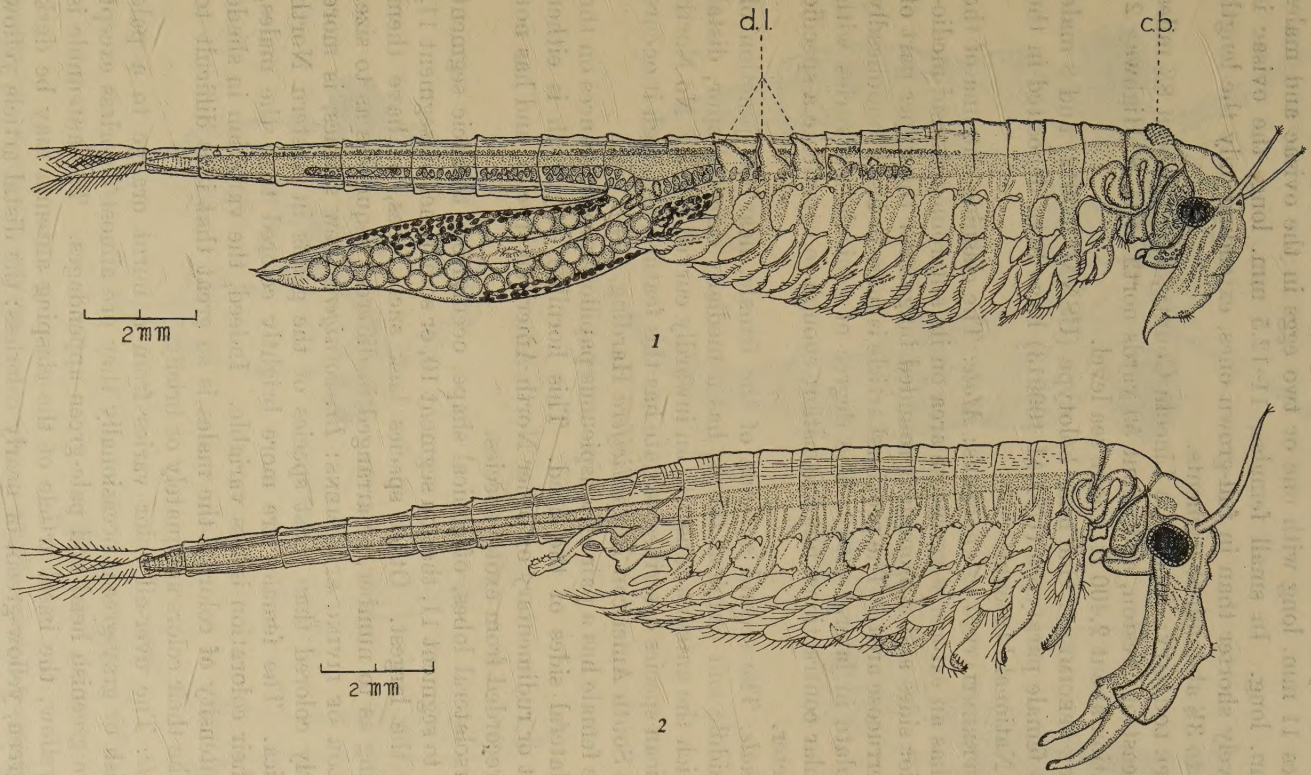
(4–5) mm. long, without apophysis; near its junction with the head an anteromedian bulging area (pulvillus) bearing minute spinules 7–10 microns long; a padlike area of cuticular verrucae on the medioanterior and anteromedian sides of its lower half, with a prominent, uncornified, anterior protuberance near the proximal end of the verrucose area. The proximal article presents a more or less prominent geniculate bend as seen in lateral view, with the uncornified bulge at the angle of the bend. Distal article of the antenna 2.5 (2–3) mm. long, somewhat flattened laterally, curving gently inward to a pointed tip with a roughened area. Thoracic appendages typical of the genus; branchial lamina entire with serrated margins; endopodite produced medially, the heavy spines of the distal end and median border thickly beset on all sides with distally directed spinules. Second genital segment with a pair of hollow eminences on ventral side. The penes bear each a chitinized spur 0.26 (0.22–0.31) mm. high near the tip of the rigid portion; the retractile portions when fully protruded present two distal lobes, each with 6 to 10 pyramidal teeth. Cercopods 2.3 (2–2.75) mm. long, distinctly articulated to the telson, with long, plumose hairs on both lateral and median margins.

*Female:* Total length, from front to end of cercopods, 29 (21.5–33.5) mm. Average ratio of length of head and thorax to genital segments, abdomen, and cercopods 1:1.48. Transversely oblong nuchal organ on top of head. A retrorse, papillose protuberance, rising 0.35–0.55 mm. above the surface, is located on each side of the head dorsal to the mandibular articulation. Compound eye in lateral view slightly flattened dorsoventrally, 0.62 (0.6–0.7) mm. by 0.76 (0.6–0.85) mm. Antennule 1.8 (1.5–2.5) mm. long, terminated by three setae and eight aesthetascs. Antenna 3 (2.2–3.5) mm. long, cylindrical, with a median spur 0.18–0.35 mm. long at the junction of the middle and distal thirds, distal to which the antenna tapers to a sharp, incurved point. Thoracic segments 6 to 11 each with a right and left dorsolateral, conical protuberance, of which the last four, only, are large enough to be conspicuous. The largest protuberance, 0.5 to 0.9 mm. high, usually on segment 10, occasionally on segment 11. Ovisac fusiform, extending backward for the length of 4.75 (4.3–5.8) abdominal segments; may contain up to 416 eggs. Eggs from preserved specimens 0.29–0.34 mm. in diameter. Cement glands consist of two closely appressed masses of large cells at anterior end of ovisac; from each mass a row of cells extends for from 65 percent to 80 percent of the length of the ovisac on its dorsal side and widens at its posterior end, and similar rows of cells extend posteriorly along the midventral line for about half the length of the ovisac, without the posterior expansion. Shaft of cercopods 2.2 (1.9–2.8) mm. long, with long plumose setae on lateral and median borders.




FIGURES 1 AND 2: *Branchinecta cornigera*, new species. 1, Female 20 mm. long (d.l., dorsalateral lobes on side of thorax; c.b., corneous protuberance on lateral side of head); cement glands are depicted in solid black. 2, Male 20.4 mm. long. (Both × 7.5.)

Smallest specimens which obviously were sexually mature were females 11 mm. long with one or two eggs in the ovisac and males 12 mm. long. In small females, 11–12.5 mm. long, the ovisac is relatively shorter than in full-grown ones, extending only the length of 2½ to 3½ abdominal segments.

TYPE LOCALITY: A pond in Lincoln County, Wash., about 8½ miles southeast of Creston, and about 50 yards north of U. S. Highway 2. Elevation about 2,400 ft. above sea level.

TYPE SPECIMENS: One male holotype (USNM 100912) and 8 male and 8 female paratypes (USNM 100913) have been deposited in the U. S. National Museum.

DIFFERENTIATING CHARACTERS: *Male:* The clasping antenna of the male has an extensive verrucose area on its anteromedian and medioanterior sides and a prominent rounded bulge near the upper part of the verrucose area. The proximal article is more or less pronouncedly geniculate in lateral view. The degree of geniculation varies with muscular contractions, but is constant enough to constitute a specific character.

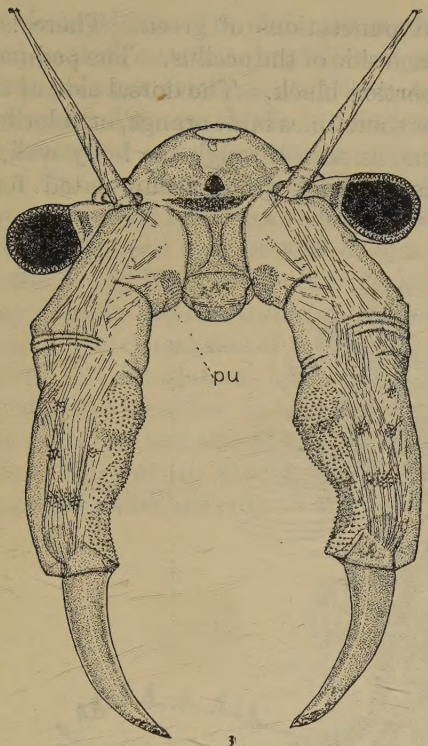
*Female:* The second antenna of the female, near the junction of the middle and terminal thirds, has a medially directed spur, distal to which the antenna tapers to an inwardly curved point. No North American species described to date has this feature, although it occurs in the South American *Br. pollicifera* Harding, 1940.

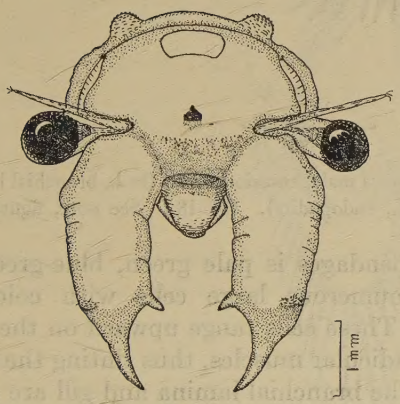
The female has a pair of conspicuous papillose protuberances on the dorsolateral sides of the head. This hornlike outgrowth is either absent or rudimentary on other North American species, and has not been recorded from exotic species.

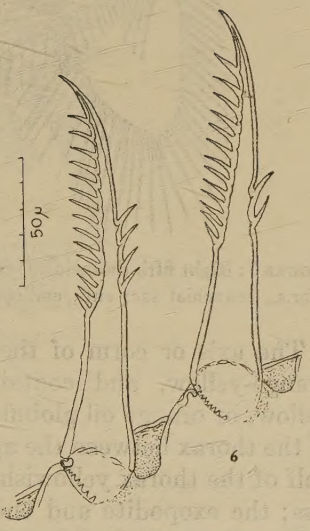
Dorsolateral lobes, of conical shape, occur from thoracic segment 6 or 7 to segment 11, that on segment 10, or sometimes on segment 11, being the largest. Other species lack such lobes, or have them differing as to number, or arranged in different sequences as to size.

COLOR OF LIVING SPECIMENS: *Br. cornigera,* new species, is more brightly colored than most species of the genus in western North America. The females are more brightly colored than the males, and their coloration is less variable. Indeed, the variation in shade and intensity of color of the males is so great that it is difficult to describe their colors adequately or briefly.

*Male:* The over-all color varies from a burnt orange to a pale greenish or gray-green; occasionally they are almost colorless except for the greenish head and pale green appendages. The antennule is pale yellow, the basal article of the clasping antenna may be dark blue-green, yellow-green, or nearly colorless; the distal article yellow to orange with greenish punctations on the lateral side, and gray on the roughened area near the tip. The front and top of the head are






FIGURES 3–6: *Branchinecta cornigera*, new species. 3, Anterior aspect of head, male (pu, pulvillus). 4, Same, female. 5, Spine from median border of endopodite of thoracic appendage of a male. 6, Spines from median border of thoracic appendage of a female. (3, 4, × 10; 5, 6, × 340.)

often yellow, but with scattered punctations of green. There is a large bluish spot on the front on each side of the ocellus. The peduncle of the eye is yellow, the corneal portion black. The dorsal side of the thorax is grayish, grayish green, or sometimes faint orange, or colorless. The anterior third of the intestine, as seen through the body wall, is yellow; the posterior two-thirds is black from accumulated food residues.

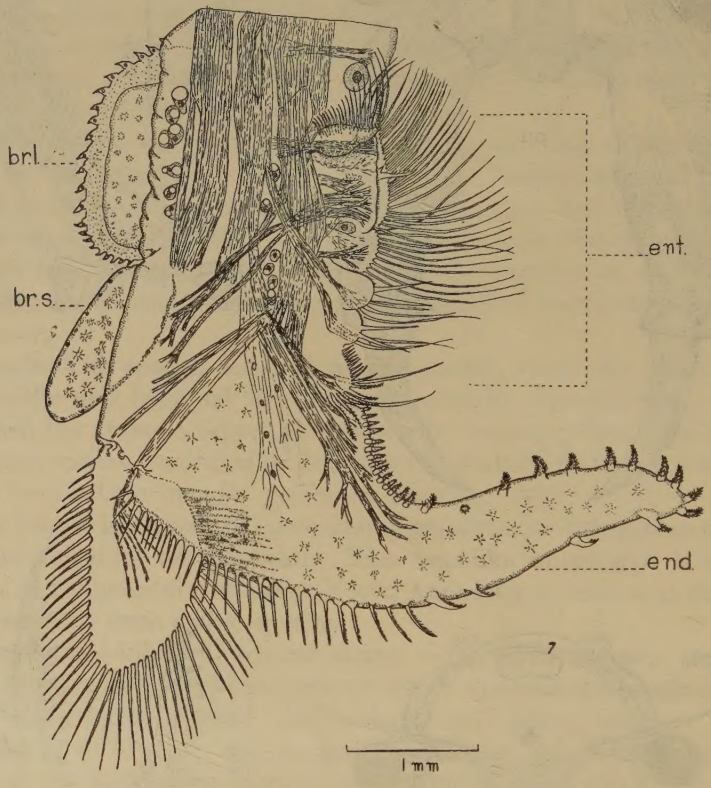



FIGURE 7: Right fifth thoracic appendage of a male, anterior aspect (br.l., branchial lamina; br.s., branchial sac; ent., endites; end., endopodite). (× 18.) See note, figure 8.

The axis or corm of the appendages is pale green, blue-green, or orange-yellow, and contains numerous large cells with colorless, yellow, or orange oil globules. These cells range upward on the sides of the thorax between the appendicular muscles, thus tinting the lower half of the thorax yellowish. The branchial lamina and gill are colorless; the exopodite and endopodite nearly colorless to pale green or dark yellow; the endites pale green bordered with yellow.

The dorsal and lateral sides of the genital segments are like adjacent parts of the abdomen and are nearly colorless; the ventral sides are colorless or yellow. The spur, and border of the penis anterior to it,

are dark yellow. The abdomen may be colorless, except for the black, food-packed intestine, but often is pale gray-green or grayish yellow. Cercopods are colorless, to yellow, orange-yellow, or pinkish.

*Female:* The antennule is colorless to pale yellow or salmon-pink. The antenna is yellow with a greenish wash, or green with a yellow tip. The top of the head is faint blue-green, but often the entire head appears yellow from the yellow digestive caeca. The "horns" on the side of the head may be yellow, blue, or blue-gray. The corneal part of the eye is black. The labrum is greenish, spotted with blue, and may contain large, brownish, internal cells visible through the integument. The dorsal side of the thorax may be colorless, whitish, or faint green; the dorsolateral lobes colorless to faint yellow. The anterior third of the intestine, as seen through the body wall, is yellow to pink; the posterior two-thirds is black with contained food residues. The lateral sides of the thorax, above the appendages, are blue; the blue extends further dorsally in the last four segments. The blue color is

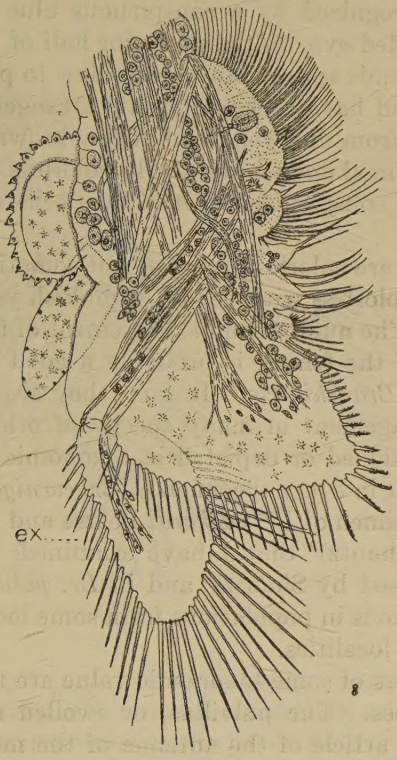



FIGURE 8: Right fifth thoracic appendage of a female, anterior aspect (ex., exopodite). (× 18.) Note: No attempt has been made to represent the setules of the plumose setae which fringe the thoracic appendages. On the ventral border of the endopodite the plumose setae gradually become thicker and assume the character of spines, with spinules replacing the setules.

caused by large, vividly blue cells which occur among the appendicular muscles, and also as a layer applied to the dorsal side of the intestine throughout its length, and to the ventral side in the thoracic region. The axis, or corm, of the appendages is colorless or pale green, sometimes contains blue cells, and in addition has large cells, less numerous than in the male, with yellow, orange, or brown oil globules. Endites, exites, and endopodite and exopodite are colored as in the male.

The ovary appears yellowish white to light blue, depending on the stage of development of the large oöcytes, and can be plainly discerned through the body wall from the fourth or third abdominal segment to the eighth or seventh thoracic segment.

The color pattern of the ovisac is characteristic of the species. The proximal third of its wall is colorless to pale yellow; the middle third yellow, orange, or pinkish yellow; about two-thirds of the posterior third is bright blue, and the tip, about 12½ percent of the total length, is white or faintly blue. In the case of living females, the species can be easily recognized by a conspicuous blue area, which can be seen by the unaided eye, on the posterior half of the ovisac.

The cement glands appear brownish yellow to pale brown under low magnification, and have a characteristic arrangement. Eggs, within the ovisac, vary from dull yellow to yellow-brown.

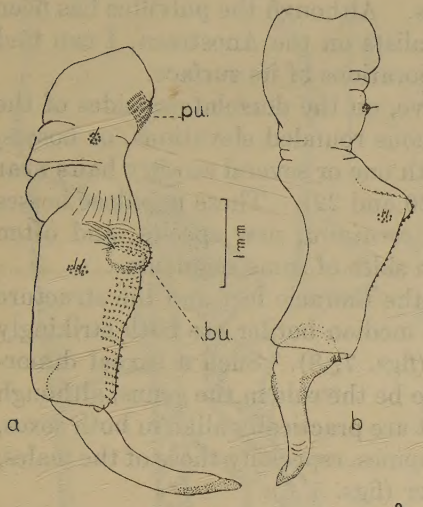
The walls of the abdomen are nearly colorless except for the black intestine and the conspicuous layer of blue cells along the dorsal side of the intestine.

The cercopods are colorless in most, but sometimes are pale yellow, pale orange, or colorless with yellow or pinkish yellow borders.

Discussion: The number and arrangement of the dorsolateral lobes on the thorax of the female is probably a good specific character in many species of *Branchinecta*. In fact, they are conspicuous in size, shape, and arrangement in many species of other genera, but have rarely been mentioned or depicted in taxonomic descriptions. They have been present in every specimen of *Br. cornigera*, new species, and also in every specimen of *Br. packardi* Pearse and *Br. lindahli* Packard (as revised by Shantz)[2] that I have examined. In *Br. coloradensis* Packard (as revised by Shantz)[2] and in *Br. paludosa* (O. F. Müller) they are conspicuous in populations from some localities and absent in those from other localities.

Other characters of some taxonomic value are the pulvillus and the dorsolateral bosses. The pulvillus, or swollen area on the median side of the basal article of the antenna of the male near its junction with the head, is present and conspicuous in some species of *Branchinecta* and absent, or barely represented, in others. When present, it is covered with minute spinules, verrucae, or denticles

[2] See under heading of "Remarks," page 34.

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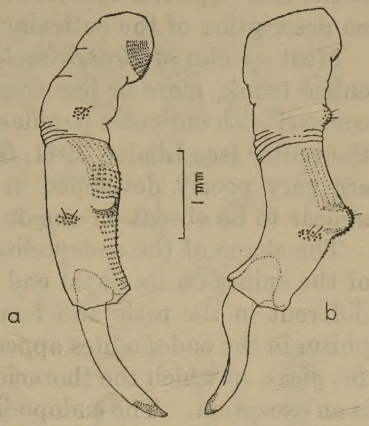


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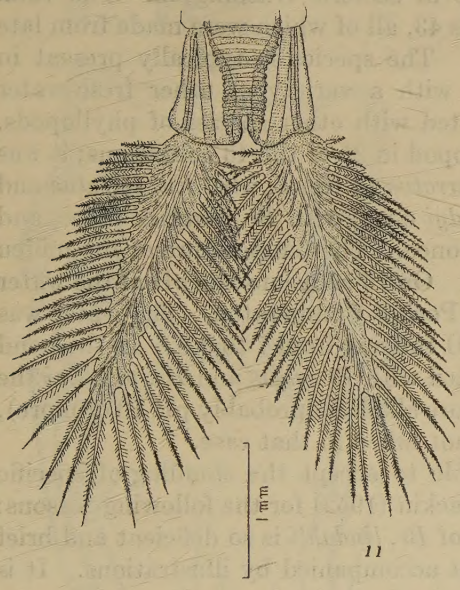


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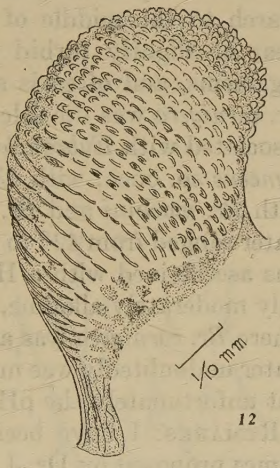


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FIGURES 9–12: *Branchinecta cornigera.* 9, Right antenna of male: a, anterior view (pu., pulvillus; bu., uncornified protuberance of second antenna); b, lateral view. 10, Right antenna of male (another specimen): a, anterior view; b, lateral view. The right antennae from the two specimens show that although the antennae of the male vary in shape with muscular contractions, nevertheless the uncornified bulge and the angular outline of the anterior border remain evident. 11, Telson and cercopods of a female 27 mm. long. 12, Hornlike protuberance from left side of head of female, lateral aspect. (9, 10, × 11.5; 11, × 18; 12, × 80.)

which differ in shape in each species. Although the pulvillus has been noted and depicted by some specialists on the Anostraca, I can find no description of the cuticular elaborations of its surface.

Most species of *Branchinecta* have, on the dorsolateral sides of the entire trunk, more or less conspicuous rounded elevations, or bosses, covered with cuticular papillae, with one or several sensory hairs near the center (see Linder, 1941, figs. 20 and 22). These papillose bosses are very poorly developed in *Br. cornigera*, new species, and often appear to be absent on one or both sides of some segments.

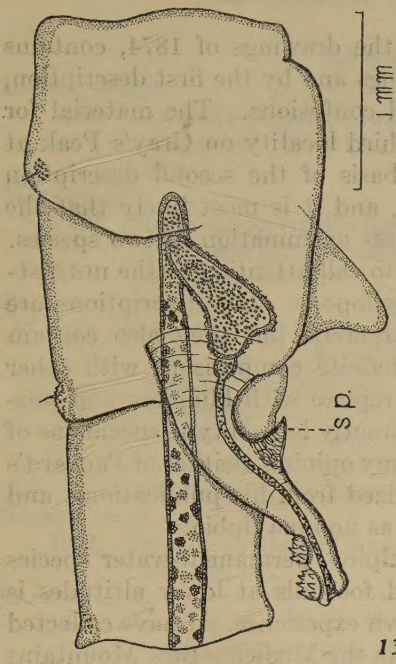
The shape of the endopodite of the thoracic feet and the structure of the spines on its distal end and median border are both strikingly different in the male and female (figs. 7, 8). Such a sexual dimorphism in the endopodites appears to be the rule in the genus, although *Br. gigas*, in which the thoracic feet are practically alike in both sexes, is an exception. The endopodital spines, especially those of the males, constitute a minor specific character (figs. 5, 6).

DISTRIBUTION AND ENVIRONMENT: *Branchinecta cornigera*, new species, has been collected from 30 temporary ponds in Grant, Lincoln, Spokane, and Adams Counties in eastern Washington. The total number of separate collections is 43, all of which were made from late March to the middle of May. The species is typically present in clear or slightly turbid water with a variety of other fresh-water organisms, and often is associated with other species of phyllopods. *Br. cornigera* was the sole phyllopod in 25 of the 43 collections; it was associated with *Eubranchipus serratus* 13 times; with *Eu. serratus* and *Lynceus* sp. once; with *Eu. bundyi* once; with *Br. mackini* twice, and with *Br. mackini* and *Br. gigas* once. The temperature of the milieu water ranged from 42° to 59° F. On 15 occasions the pH of the water was ascertained with a Hellige Pocket Comparator. The water was only moderately alkaline, the pH ranging from 7 to 8.8. In the pond where *Br. cornigera* was associated with *Br. gigas* and *Br. mackini* the water undoubtedly was much more alkaline (probably pH 10 or more), but unfortunately the pH was not taken in that case.

REMARKS: I have been unable to accept the shuffling of specific names proposed by Dr. J. G. Mackin (1952) for the following reasons:

Packard's (1883) description of *Br. lindahli* is so deficient and brief as to be meaningless, and is not accompanied by illustrations. It is not possible to recognize the species from the description.

Packard's original (1874) description of *Br. coloradensis* is entirely inadequate, and the drawings are so trivial and devoid of essential detail as to be without taxonomic utility. This description was based upon one female from an altitude of 12,500 ft. in the Colorado Rocky Mountains, and about 100 specimens of both sexes from the indefinite locality of "Colorado." Packard's second (1883) description

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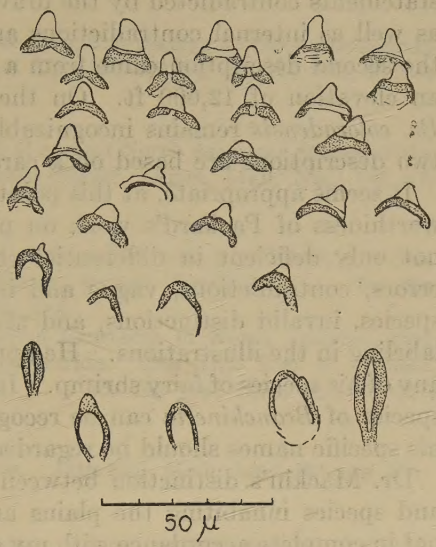


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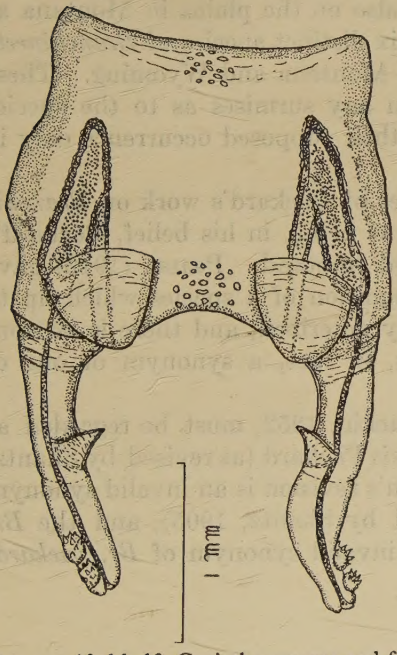


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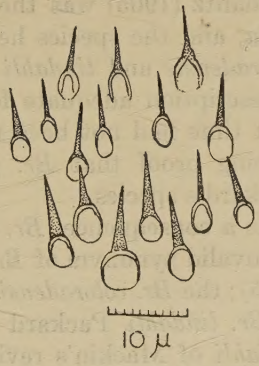


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FIGURES 13–16: 13, Genital segments and first abdominal segment of a male 23 mm. long, lateral aspect (sp., spur on copulatory appendage). 14, Genital segments of a male 23 mm. long, ventral aspect. 15, Cuticular verrucae from the verrucose area of the antenna of a male. 16, Cuticular spinules from the pulvillus of the antenna of a male. (13, 14, × 24; 15, × 460; 16, × 1066.)